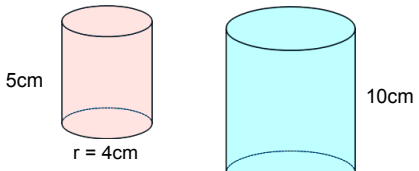
Areas and Volumes of Similar Solids

Similar solids--same shape, but not necessarily the same size

All spheres are similar.

For other solids:
Bases must be similar and other corresponding lengths must be proportional.

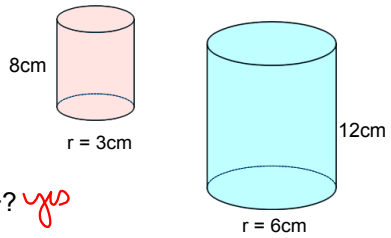


ex 1:
Are the bases ~? yes

Scale factor? $\frac{4}{8} = \frac{1}{2}$

Are other lengths proportional? ~ solids

$\frac{5}{10} = \frac{4}{8} = \frac{1}{2}$ ✓



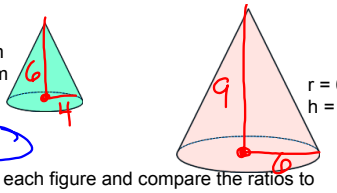
ex 2:
Are the bases ~? yes

Scale factor? 1:2

Are other lengths proportional? Not ~

$\frac{8}{12} \neq \frac{1}{2}$

ex 3: r = 4cm, h = 6cm; r = 6cm, h = 9cm



Are bases ~? yes
Heights ~? yes
Scale Factor? 2:3

Find the following for each figure and compare the ratios to scale factor.

	small		large	
l	$2\sqrt{13}$	2:3	$3\sqrt{13}$	
C	8π		12π	$\frac{16}{36}$
B	16π	2:3	36π	
LA (½pl)	$8\pi\sqrt{13}$	4:9	$18\pi\sqrt{13}$	$\frac{8}{18}$
~~TA~~		4:9		
V = ⅓Bh	32π	8:27	108π	$\frac{32}{108}$

Theorem 13.1--If the scale factor of 2 ~ solids is a:b, then:
1. The ratio of corresponding perimeters is a:b (l, h, edge, perimeter)
2. The ratio of corresponding areas is $a^2:b^2$ (B, LA, TA)
3. The ratio of corresponding volumes is $a^3:b^3$

Ex:
The scale factor of 2 cones is 5:6.
What is the ratio of:

p 5:6
LA 25:36
TA 25:36
V 125:216
l 5:6
r 5:6

If the LA of smaller is 100π, what is LA for the larger?

$\frac{25}{36} = \frac{100\pi}{x}$ $x = 144\pi$

If the V of smaller is 86.4π, what is V for the larger?

$\frac{125}{216} = \frac{86.4\pi}{V}$ $V = 149.3\pi$

Ex:
Two solid metal cylinders are similar.
radius of 1st = 10cm
radius of 2nd = 14cm

What is the scale factor? $\frac{10}{14} = \frac{5}{7}$

If the smaller cylinder (volume) weighs 2.5 kg, how much does the larger one weigh?

$\frac{125}{343} = \frac{2.5}{x}$ 6.86 kg

Ex:
Two similar pyramids have LA = 12cm^2 and LA = 27cm^2.

$\frac{12}{27} = \frac{\sqrt{4}}{\sqrt{9}}$ ← Ratio of Area

What is the scale factor? $\frac{2}{3}$

If the volume of the smaller is V = 20cm^3, what is the volume for the larger?

$\frac{8}{27} = \frac{20}{V}$

$V = 67.5\ cm^3$

Ex:
Two similar prisms have LA = 27cm^2 and LA = 75cm^2.

What is the scale factor? $\frac{27}{75} = \sqrt{\frac{9}{25}}$ R. Area → $\frac{3}{5}$

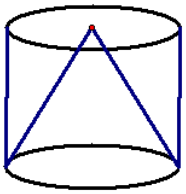
If the volume of the smaller is V = 121.5cm^3, what is the volume for the larger?

$\frac{27}{125} = \frac{121.5}{V}$

$V = 562.5\ cm^3$

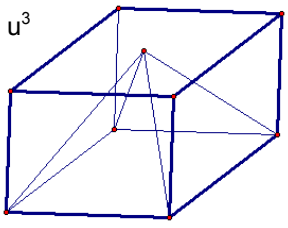
Is this cylinder ~ to the cone? No

Cylinder Volume = 36π u^3
Cone Volume = ?



cyl. $V = Bh$
cone $V = \frac{1}{3}Bh$ $\frac{1}{3}36\pi = 12\pi\ u^3$

Pyramid Volume = 9 u^3
Prism Volume = ?



$\frac{1}{3}Bh$ $V = 9\ u^3$
Bh $V = 27\ u^3$

HW
p710-712
3-10, 27-31